Buncher Cavity Pre-Design Review: Minutes

July 16, 2012

Goals:

Present current status of the PX MEBT BC development and try to identify possible flaws in the design and/or fabrication. The presented design approach is based on the existing FRS (docbase #1071); to make a transition from the **FRS** to **Technical Specifications**, some degree of design work is required, and this review should show whether we have enough information to start the design.

Technical Specifications (**TS**) should define ways how all elements of the cavity should be designed and what fabrication (including brazing and finishing) and acceptance (including low-power intermediate RF measurements) steps are needed.

Due to vacation time, the review took place in two stages: July 10 and July 16

June 10

Participants:

Meyiu Chen
Ivan Gonin
Valeri Lebedev
Don Mitchell
Leonardo Ristori
Gennady Romanov
Alexander Shemyakin
Iouri Terechkine
Vyacheslav Yakovlev
John Zweibohmer

Slides of the presentations by M. Chen (mechanical aspects of the design), I. Gonin (RF aspects of the design) and I. Terechkine (Introduction and the spoke cooling).

The next features of the cavity design were introduced that were different in the previous version of the design presented on June 05, 2012:

1. The attempt was made to make flange-to-flange distance smaller; getting 300 mm seems quite feasible.
2. After analyzing several options of making beam line part of the cavity, it was suggested to assemble the body of the cavity of three pieces and to fabricate the central piece (a drift tube area) by machining. This ensures needed precision of machining and simplifies alignment of the spoke.
3. It was proposed to make the cooling of the spoke by using a coaxial contr-flow cooling pipe. This way, the maximum temperature of the spoke can be kept on a reasonable low level.

4. The round cross-section of the spoke was tried in combination with reduces aperture of the beam bore. The power dissipation in the cavity became smaller than it was in the case when the elliptical cross-section was used with larger (40 mm) bore.

   The next comments were made during discussion:
   1. Maximum water supply pressure in the FRS (20 bar) should be changed. New value must be agreed with Maurice Ball.
   2. The type of the instrumentation on each cavity (pressure monitors, flow monitors, and temperature sensors) must be finalized.
   3. The bottom lid with the vacuum port may be made of SS only, copper plating is not that necessary.
   4. The size of the flange for pimping out must be agreed upon.
   5. The blind end water channel in the stem to avoid water-vacuum braze joint is desirable.
   6. The design of the cooling channel must be discussed with Maurice Ball.
   7. The machining accuracy and surface finish requirements for CH cavities proved to be quite sufficient, and for the re-bunchers it is recommended to use similar requirements.
   8. RF port tube brazing technique needs to be determined.
   9. Surface finishing must be agreed with Alex Chen.
   10. Type of RF connectors must be agreed with Ralph Pasquinelly.
   11. It was recommended to release a specification for fabrication as it was done in the case of the HINS cavity production (5500-ES-371031).

A possibility of assigning a designer to the project was discussed. According to Don Mitchell, at the moment, it seems possible to see a designer as early as the end of July.

June 16

Participants:
Maurice Ball
Meyiu Chen
Timergali Khabiboulline
Iouri Terechkine

Under discussion were the next issues:
- details of the cavity design
- cooling of the central stem of the cavity
- manifolds and monitors in the cooling circuit
- working temperature and allowed pressure

A summary of the meeting can be stated as following:

1. Although suggested coaxial contra-flow cooling scheme was not used at FNAL previously, it can be tried as it is can be easily repaired if clogging occurs. A mockup should be made at early design stage to verify calculated flow rates and the heat removal capacity.
2. A gap of the cooling part of the water channel must be made reasonably big; flow velocity in the channels must be kept within the interval between ~1.2 m/s and ~5 m/s.
3. The option of making water connections closer to the floor level (with the input water flow heading up) must still be considered as it can reduce probability of the clogging.
4. A manifold that distributes water into cooling circuits of the cavity must contain pressure and flow monitors and can be placed in a convenient place inside or outside the PXIE enclosure.